CLAIMS

What is claimed is:

1. An integrated semiconductor device comprising:

a semiconductor substrate;

a laser on the substrate having an active layer and a current-induced grating producing a single-mode output light signal at a data rate greater than 622 Mb/sec in isolator-free operation, wherein the grating has a coupling strength product κL greater than 3, where κ is a coupling coefficient and L is a length of the laser cavity.

2. The semiconductor device of Claim 1 wherein the grating comprises a complex-coupled grating.

3. The semiconductor device of Claim 2 wherein the grating comprises a first semiconductor material overgrown with a second semiconductor material.

4. The semiconductor device of Claim 1 wherein the active layer comprises a multiple quantum well structure.

5. The semiconductor device of Claim 4 wherein the multiple quantum well structure is AlInGaAs.

6. The semiconductor device of Claim 1 wherein the data rate is about 2.5 Gb/sec.

7. The semiconductor device of Claim 1 further comprising a modulator on the substrate for modulating the output light.

8. The semiconductor device of Claim 7 wherein the modulator comprises an electroabsorption modulator.

9. The semiconductor device of Claim 7 wherein the modulator comprises a Mach Zehnder modulator.

10. The semiconductor device of Claim 1 wherein the laser comprises a distributed feedback (DFB) laser.

11. A method for fabricating an integrated semiconductor device comprising:

forming on a semiconductor substrate an active layer; and

forming a current-induced grating above the active layer to produce a laser cavity emitting a single-mode output light signal at a data rate greater than 622 Mb/sec. in isolator-free operation, wherein the grating has a coupling strength product κL greater than 3, where κ is a coupling coefficient and L is a length of the laser cavity.

12. The method of Claim 11 wherein the output light has a wavelength of about 1.5 μm.

13. The method of Claim 11 wherein the grating comprises a complex-coupled grating.

14. The method of Claim 11 wherein the grating comprises a first semiconductor material overgrown with a second semiconductor material.

15. The method of Claim 11 wherein the active layer comprises a multiple quantum well structure.

16. The method of Claim 11 wherein the multiple quantum well structure is AlInGaAs.

17. The method of Claim 11 further comprising forming a modulator on the substrate for modulating the output light.

18. The method of Claim 17 wherein the modulator comprises an electroabsorption modulator.

19. The method of Claim 17 wherein the modulator comprises a Mach Zehnder modulator.

20. An optical communication device comprising:

a semiconductor laser having an active layer and a current-induced grating producing a single-mode output light signal at a data rate greater than 622 Mb/sec., wherein the grating has a coupling strength product κL greater than 3, where κ is a coupling coefficient and L is a length of the laser cavity;

an optical fiber for receiving the output light; and

optics for isolator-free coupling of the output light into the optical fiber.

21. The device of Claim 20 wherein the output light has a wavelength of about 1.5 μm.

22. The device of Claim 20 wherein the grating comprises a complex-coupled grating.

23. The device of Claim 22 wherein the grating comprises a first semiconductor material overgrown with a second semiconductor material.

24. The device of Claim 20 wherein the active layer comprises a multiple quantum well structure.

25. The device of Claim 24 wherein the multiple quantum well structure is AlInGaAs.

26. The device of Claim 20 wherein the data rate is about 2.5 Gb/sec.

27. The device of Claim 20 further comprising a modulator integrated with the laser for modulating the output laser light before coupling into the optical fiber.

28. The device of Claim 27 wherein the modulator comprises an electroabsorption modulator.

29. The device of Claim 27 wherein the modulator comprises a Mach Zehnder modulator.

30. The device of Claim 20 wherein the laser comprises a distributed feedback (DFB) laser.

31. The device of Claim 20 wherein the optics for isolator-free coupling comprise at least one lens disposed between the laser and the optical fiber.

32. The device of Claim 31 wherein the optics for isolator-free coupling comprise at least two lenses disposed between the laser and the optical fiber, including a collimating lens and a coupling lens.

33. The device of Claim 31 wherein the at least one lens comprises a fiber lens at an end of the fiber for receiving the output light.